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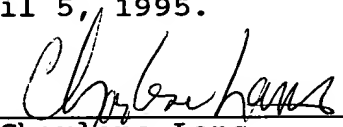
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COMPOSITE STRUCTURES AND
METHOD OF JOINING COMPOSITE PARTS

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, DC 20231



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Charlene Lans

APPEAL BRIEF
UNDER 37 CFR 1.192

Further to the Notice of Appeal filed February 6, 1995, appellants submit the following authorities and arguments in support of their appeal from the Examiner's refusal to allow claims 1-4, 6, 7, 9-15, and 19. Enclosed herewith is the requisite fee set forth in Section 1.17(f) of \$140.00

I. STATUS OF ALL CLAIMS

This is an appeal from the Examiner's refusal to allow claims 1-4, 6, 7, 9-15, and 19. When filed, this case included claims 1-22. In appellants' response of July 13, 1994, to the Examiner's restriction requirement of June 28, 1994 appellants elected to prosecute claims 1-4, 6-7, 9-19, 20 and 22 with traverse. Therefore, claims 5, 8 and 21 were withdrawn from consideration. Claims 1-4, 6, 7, 9-15 and 19

were finally rejected in a Final Office Action dated October 12, 1994 and again rejected in an Advisory Action dated December 28, 1994. Hence this appeal.

Claims 16-18, 20 and 22 (See Appendix B) were not the subject of either the Examiner's 35 USC §112 or §103 rejections in the Final Office Action of October 12, 1994 nor the Advisory Action of December 28, 1994 and therefore were not twice rejected as required by 37 CFR §1.19(c). Since, however, the Examiner has failed to address these claims, appellants appeal the initial rejection of these claims as well. No other claims were presented during the prosecution of this case.

II. STATUS OF AMENDMENTS

An amendment was filed December 14, 1994. However, this amendment only involved inserting a statement of government rights into the specification. This amendment did include certain remarks regarding the final rejection of October 12, 1994. The proposed amendment and remarks were entered into the record by the Examiner's advisory action of December 28, 1994.

III. SUMMARY OF THE INVENTION

Appellants disclose and claim a method of joining two composite parts ("adherends") (Fig. 3). A composite part generally comprises layers upon layers of fabric impregnated with a resin. An example of the need to join two such parts is joining a composite stiffener to a composite aircraft fuselage.

In the claimed invention, first a number of reinforcing elements (e.g. boron pins) (14, 15 and 16, Fig. 2) are disposed through the thickness of each separate composite part (12 and 10, Fig. 2) to be joined together. The reinforcing elements (14 and 16 Fig. 2) are left extending from the joint surface (18, Fig. 2) of each composite part.

Then, the two parts with the reinforcing elements sticking out are assembled so that the joint surface of one part (22, Fig. 2) faces the joint surface of the other part (18, Fig. 2) defining a joint region (30, Fig. 4) therebetween. The reinforcing elements (24, Fig. 2) extending from each part are interstitially arranged in the joint region (32, Fig. 4).

An adherent (26, Fig. 2) (e.g. a braze material or a layer of resin) is disposed within the joint region about the interstitially arranged reinforcing elements and the joint surfaces.

The parts are then permanently joined together by exerting pressure upon the two composite parts (See Fig. 3) so that the extending reinforcing elements of the first part are driven through the adherent interlayer and into the other part. The extending reinforcing elements of the second part are similarly driven into the first part. As the parts are joined together (Fig. 3), the adherent is urged partially up the length of the interstitially disposed reinforcing elements (34, Fig. 4). (See page 10, lines 3-24).

This methodology of joining two composite parts has a number of benefits. First, the reinforcing elements provide additional surface area for the adherent (e.g. braze or resin) to "lock" the two parts together. Second, the reinforcing elements of one part extending into the other part (and vice versa) makes a very strong joint between the two parts. Third, the adherent tends to travel up each reinforcing element (Fig. 4) inside each part. This has proven to increase the strength of the bond between the two composite parts.

IV. ISSUES

The Examiner rejects claims 1-4, 6, 7, 9-15 and 19 under 35 USC § 112, first paragraph, as not being enabled properly by the specification. The Examiner states that "reinforcing elements" encompass steel reinforcing rods used in building construction and such a use of this term was not contemplated by the appellants' disclosure. The Examiner then goes on to state that the specification discloses certain adhesives and braze materials as suitable adherents but that the claims are not so limited, begging the question of what else is encompassed by the term "adherents"?

The Examiner also rejects claims 1, 3, 7, 9-15 and 19 under 35 USC §103 as being unpatentable over applicants previous patent, Boyce et al. In so doing, the Examiner argues that appellants method of joining composite parts and/or non-composite parts would appear to be the same or at least obvious over the method of the Boyce reference.

The issues on appeal are therefore:

1. Whether claims 1-4, 6, 7, 9-15 and 19 are patentable under 35 USC §112, first paragraph, and whether the terms "reinforcing elements" and "adherents" are described in full, clear, concise and exact terms to enable a person skilled in the art to make and use the invention.

2. Whether claims 1, 3, 7, 9-15 and 19 are patentable under 35 USC §103 over Boyce et al, since the Boyce disclosure only relates to inserting reinforcing elements into a single composite part.

Appellants respectfully request that this Board hold that the above delineated claims are patentable under 35 USC §112, first paragraph and under 35 USC §103 and request that this Board overturn the Examiner's rejections of the claims over the Boyce reference.

V. GROUPING OF CLAIMS

Claims 2-4 are dependant from independent claim 1. Claim 7 is dependant from independent claim 6. Claim 11 is dependant from independent claim 10. Claim 17 is dependant from independent claim 16. Claims 9-15, 18-20 and 22 are independent. Claims 5, 8 and 21 read on a non-elected species and were withdrawn from prosecution. The appellants assert that the claims are separately patentable and therefore do not stand or fall together.

VI. ARGUMENT

A. Prior Art: Joining

Composite laminate structures have been widely used and generally comprise layers upon layers of fabric (plies) each including an array of fibers in a resin matrix. In the past, joining two or more of these composite structures involved the use of epoxies for low temperature joints and silver base braze alloys for intermediate temperature joints. Holko found and disclosed in U.S. Patent No. 5,021,107, however, that for high temperature applications, wherein carbon-carbon composite component joints must withstand temperatures as high as 3000° F., an interlayer material (adherent) used in the joint between components such as, TiSi_2 , vacuum furnace brazed, resulted in an improved joint.

Appellants evaluated Holko's teaching to join composite parts such as joining a stiffening stringer to an aircraft's fuselage. Unfortunately, although this approach might create a cohesive joint, failures as shown in applicant's disclosure (6, in Fig. 1) would still occur between the first few plies of the composite material 7 of one part.

B. The Boyce reference

Before attempting to use the Holko technology to join two composite parts, the appellants had invented a methodology for reinforcing or strengthening a single composite part to prevent the individual plies of fabric

from delaminating under stress. This is the Boyce patent (No. 4,808,461) which describes inserting a single set of reinforcing elements (e.g. boron pins) into a decomposable foam body.

The foam body is then placed on a composite part to be reinforced by the pins. The foam body acts as a carrier for the pins while pressure is applied to the foam body to drive the pins through the plies of the composite part for reinforcement of the part. The pins reinforcement of the composite reduces the instances of delamination between the plies of a single composite part.

The foam body collapses as the pins are inserted and it is ultimately scraped off the now reinforced part. After the foam residue is removed, any extending portions of the elements are filed flush with the surface of the composite.

C. The Present Invention

It was not until after the '461 patent that Boyce et al. realized that the reinforcing elements (e.g. boron pins) could be separately inserted through the thickness of two composite parts and, instead of filed flush, left extending. The appellants learned that the extending portions of the reinforcing pins of each separate part form an excellent joint between the two composite parts when they are pressed into the opposing part. (See specification page 4, lines 9-17.)

Appellants claim this method for joining two composite

parts such that the joint region is reinforced to the extent that failures such as illustrated at 6 in Fig. 1 were eliminated.

The claimed method includes disposing separate reinforcing elements through the thickness of one part (adherend) and leaving these reinforcing elements extending out from the joint surface. The other part is prepared the same way. The two parts are then assembled so that these joint surfaces, including the reinforcing elements extending from each part, face each another and define a "joint region".

An "adherent interlayer" of some kind (e.g. braze or resin) is then disposed within this joint region between the adherends and about the now interstitially arranged extending reinforcing elements. Pressure is applied to the parts driving them together such that the extending reinforcing elements of one part are inserted into the other part and vice versa. (See claim 1)

The advantages of this methodology are not only a stronger reinforced joint region between the two composite parts. In addition, this methodology allows the two "adherends" to be cured separately and therefore manufactured separately and only brought together for the purposes of joining them with the adherent interlayer. Also, the composite parts themselves are strengthened due to the insertion of the reinforcing elements.

D. The 35 USC §112, FIRST PARAGRAPH REJECTION

The Examiner states that the claimed elements of "reinforcing elements" and "adherents" are not properly defined in the specification and that the specification does not enable a skilled artisan to properly practice appellants' claimed invention. Therefore, claims 1-4, 6, 7 and 9-15 which use these terms stand rejected under 35 USC §112, first paragraph.

The appellants respectfully disagree with the Examiner. Appellants have used the dictionary definition for most of the terms in the claims and those skilled in the art will readily understand the scope of the claims.

As illustrated in Fig. 2, appellants' invention involves joining two structures, e.g. stiffener 12 and composite part 10. Each part to be joined is called an "adherend". Appellants define the term "adherend" in the specification as denoting one part or structure to be joined with another part or structure (See page 10, lines 6-7). This is the same as the dictionary definition for "adherend": "one of the bodies held to another by an adhesive". (Websters New Collegiate Dictionary, (1979)).

The "adhesive" between two bodies or parts is broadly called the "adherent": "able or tending to adhere" (Id). An "adherent" as the appellants use the term in the claims and disclosure is meant to include film adhesive, prepreg materials or other similar braze materials that are commonly used by skilled artisans. (See page 10, lines 12-13).

"Reinforcing elements" (i.e. the pins) 14 and 16 are inserted first through one "adherend" and then separately through the other "adherend" and left exposed or extending in the area of the joint region (See 30, Fig. 4). The reinforcing elements used differ by application, but, for example, they may be boron filaments, carbon, glass, organic or ceramic fibers, iron, or aluminum rods or wires (See page 11, lines 1-2), or other analogous structures used to reinforce the "adherends".

After the reinforcing elements are driven into the "adherends", an "adherent", usually a film, braze, adhesive or prepreg material (See pg. 10, lines 12-13), is disposed in the joint region between the two "adherends".

Pressure is then used to drive the two "adherends" towards each other and the "adherent" in the now closing joint region. This pressure drives the extended portions of the reinforcing elements through the "adherent" and into the opposing "adherend" to create a very strong bond between two "adherends". The joint between the two parts contains the "reinforcing elements" surrounded by the "adherent" (See Fig. 4).

The "adherent" used may be urged partially up the length of the individual reinforcing elements, as shown at 34 in Fig. 3, to form an even more cohesive bond.

As the Court of Appeals for the Federal Circuit stated in W.L.Gore and Associates, Inc. v. Garlock, Inc.:

[p]atents, however are written to enable those skilled in the art to practice the invention, not the public.

The Court of Appeals for the Federal Circuit has also stated with regard to enablement of a patent:

Enablement is a legal determination of whether a patent enables one skilled in the art to make and use the claimed invention...it is not precluded even though some experimentation is necessary, although the amount of experimentation must not be unduly extensive,...further, a patent need not teach, and preferably admits, what is well known in the art.

Hybrid Tech. Inc. Fee. v. Monoclonal Antibodies, Inc., 802, F.2d 1367, 1384, 231 USPQ 81, 94 (1986).

Appellants have used the dictionary definition of "adherend" and "adherent" and have expressly defined these terms in the specification. Moreover, appellants give examples of "reinforcing elements" and "adherents". Therefore, appellants have clearly complied with the requirements of 35 USC §112, first paragraph.

The claims of a patent are meant to be read in light of the specification. This includes not only terms defined expressly in the specification but also terms not so expressly defined.

Accordingly, appellants submit that the specification is directed at artisans skilled in composite structures.

Unlike the Examiner's contention, a skilled artisan would not consider steel reinforcing rods or "rebar", as used in building construction, appropriate for composite parts. Further, appellants generically described the structures and materials used in their invention. Hence skilled artisans would consider only adhesive materials

appropriate for joining composites (and not consider tar used in the paving of roads).

Appellants also submit that the Examiner has misunderstood the appellants' use of the term "adherends" and "adherents". The term "adherends" encompasses the two structures to be joined. The term "adherents" denotes the layer or material disposed between the "adherends" (the "glue") and when used, in conjunction with the "reinforcing elements", assists in cementing the parts together.

From the above, appellants submit that use of the claimed "reinforcing elements" and "adherents" are well-defined within the specification. These terms will be readily understandable to those skilled in the art of composite materials.

Therefore, the claims are proper under 35 USC §112, first paragraph. Those skilled in the art (and even those not skilled in the art), will readily understand what is meant by "adherend", "adherent", and "reinforcing element" especially since appellant's use of these terms is the same as their dictionary definition.

E. The 35 USC § 103 REJECTION

The Examiner contends that claims 1, 3, 7, 9-15 and 19 are obvious in light of Boyce et al. ('461).

Appellants submit that Boyce is an improper § 103 reference because it fails to disclose or infer: separately disposing two sets of reinforcing elements through two parts

to be joined; leaving the reinforcing elements extending from the surface of the parts; assembling the parts so that the extending elements face each other; disposing an adherent (glue) layer between the parts; and inserting the pins that extend out of one part into the other part (and vice versa). See claim 1.

The Examiner states that Boyce discloses a method of preparing composite structures which includes inserting reinforcing elements into a single improved composite part as illustrated in Figs. 4 and 5.

This is true, but appellants in the instant application claim inserting separate reinforcing elements into two parts (adherends) to be joined.

In an attempt to meet this claim language, the Examiner states that reinforcing structure 10 (a thermally decomposable foam) in Boyce is a second part to be joined.

This allegation is false. Decomposable foam body 10 is not a composite part to be joined to another composite part. Instead, decomposable foam body 10 is a vehicle for inserting reinforcing elements into a single composite part.

Foam body 10 decomposes under the elevated temperature and pressure of this methodology and collapses. (Col. 5, lines 46-64). In the final step it is scrapped off the reinforced part. (Col. 4, lines 2-6; fig. 6 and claim 18).

Boyce, to be a proper §103 reference must disclose or suggest the claimed combination of elements in appellants invention. As the CCPA held in In re Civitello, 144 USPQ

10, 12 (1964), rejection would be especially improper here since, as a matter of fact, many of appellants' claimed features are not even shown, in Boyce:

Since. . .[the reference] fails to disclose the feature of the claim relied on, we do not agree with the Patent Office that it would suggest modifying the. . .[prior art device] to contain that feature. The Patent Office finds the suggestion only after making a modification which is not suggested, as we see it, by anything other than appellant's own disclosure. This is hindsight reconstruction. It does not establish obviousness. We therefore find claim 2 allowable over the references applied.

Nowhere does Boyce disclose or infer applicant's methods of joining two structures by inserting reinforcing elements into both parts separately and then pressing these parts with their extending elements together.

Boyce does teach a method of inserting reinforcing elements 14, Fig. 1 into a prepreg 30 (a single part) to reinforce that single part. Boyce teaches first placing these reinforcing elements in a thermally decomposable foam body 10. This body is then placed on prepreg 30, heated, and subjected to elevated pressures (Fig. 5) so that the reinforcing elements are driven "into a composite structure [prepreg 30] as said thermally decomposable material collapses under the influence of said elevated temperature and pressure" (Column 5, lines 46-64). Then, the residue of the thermally decomposable foam body 10 is scraped off (Column 4, line 2-6; Fig 6; claim 18). Body 10 and prepreg 30 are never joined!

Boyce also fails to teach or suggest applicant's claimed joint region including the adherent and the reinforcing elements extending from both surfaces. (See appellants' claim 1, lines 8-13) (Also note 30 in Fig. 4 of appellants' application in contrast to Figs 4, 5 and 6 of the Boyce reference).

Instead, Boyce specifically teaches that once the reinforcing elements are inserted into the composite part, any portion of these elements extending from the surface of the composite are ground flush as indicated in Fig. 7.

This is contrary to appellants present invention which claims leaving the reinforcing elements extending out of each adherend before they are ultimately pressed together (See appellants claim 1, lines 3-5).

Although the Examiner does not discuss Fig. 8 of Boyce, it is appropriate to do so here. At first blush it may seem that Fig. 8 of Boyce discloses a method of joining two parts together.

This, however, is not true. Although Fig. 8, of Boyce does illustrate inserting reinforcing fibers 14' in critical areas to anchor composites stiffening stringers 56 and 58 (which are then co-cured with the composite laminates 60), this methodology involves driving a single set of reinforcing fibers 14' through both stiffening stringers 56, 58 and 60 at the same time. Therefore, Boyce's reinforcing fibers 14 are continuous in nature in that a single fiber is driven through both parts to be joined.

Appellants, on the other hand, now disclose and claim the use of two sets of reinforcing elements which are separately driven through two different parts such that the exposed ends are staggered from one another. (See appellants claim 1, lines 2-3) (Also note reinforcing elements 14 and 16 in Fig. 2 of appellants application and notice their orientation, 32 in Fig. 4).

The advantage over the method shown in Fig. 8 of Boyce is that one part can now be manufactured and cured and then later joined to another already manufactured and cured part. This is not possible in Fig. 8 of Boyce. Also, note the lack of an adherant in Boyce, Fig. 8. Appellant's specifically claim "disposing an adherent with said joint region..." (See appellants claim 1, lines 10-13).

Such a suggestion or inference cannot be found in Boyce. The Federal Circuit, has held that the mere fact that the prior art could be modified does not make the modification obvious unless the prior art suggests the desirability of the modification In re Gordon, 221 USPQ 1125, 1127 (Fed. Cir. 1984). "The claimed invention must be considered as a whole, and the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination." Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick, 221 USPQ 81, 488 (Fed. Cir. 1984).

Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103,

teachings of references can be combined only if there is some suggestion or incentive to do so. ACS Hospital Systems, Inc. v. Montefiore Hospital, 221 USPQ 929, 933 (Fed. Cir. 1984) (emphasis in original, footnotes omitted).

Appellants' claimed invention is not obvious over Boyce. Boyce fails to teach or suggest "A method of joining composite parts" See claim 1.

Boyce fails to teach or suggest "disposing a plurality of reinforcing elements through the thickness of two composite adherends to be joined". Id.

Boyce fails to teach or suggest "at least a number of said reinforcing elements extending from the joint surface of each said adherend" Id.

Boyce fails to teach or suggest "assembling said adherends so that the joint surface of one said adherend faces the joint surface of the other said adherend" Id.

Boyce fails to teach or suggest a defined "joint region therebetween, said extending reinforcing elements interstitially disposed in said joint region" Id.

Boyce fails to teach or suggest "disposing an adherent within said joint region about said interstitially disposed reinforcing elements and said joint surfaces". Id.

Boyce, in contrast, specifically teaches that foam body 10 is not joined to a composite part, that it is "scraped off" the part after it is used, and that the reinforcing elements are ground flush after they are inserted. Boyce also fails to mention or disclose an adherent or a reinforced joint.

Appellants' claimed methodology allows the composite parts (after receiving the reinforcing elements) to be cured in separate steps. In other words, each adherend, after having reinforcing elements inserted therein can then be separately cured prior to being joined. This allows manufacture of the two parts to occur separately save for the steps of joining and then curing the adherent interlayer and the now bonded parts. In this way, a cured stringer can be joined to a cured fuselage at the Boeing assembly plant.

In comparison, stiffening stringers 56 and 58 and composite laminate 60 of Boyce are co-cured after a single set of reinforcing fibers 14' are inserted through both parts. (See column 4, line 23).

Further, Boyce does not disclose nor infer the use of an adherent between stiffening stringers 56, 58 and composite laminate 60 or between foam body 12 and composite prepreg 30.

Appellants, in comparison, claim disposing an adherent within the joint region and that this adherent is urged to flow at least partially along the length of the extending reinforcing elements now embedded within the opposing part. (See claim 12) This is more dramatically illustrated in Fig. 4 where the adherent flows into area 34 for an even greater cohesive bond.

Therefore, appellants respectfully assert that Boyce does not render appellants' claimed invention obvious. In fact, Boyce is only a distant precursor to the technology

appellants now claim.

Not only does Boyce not teach the joining of two composite parts, as appellant does, Boyce also fails to claim the use of an adherent within the joint region between these two parts.

Accordingly, claims 1,3, 7 9-15 and 19 are patentable over the Boyce reference. Claims 16-18, 20 and 22 are also patentable.

SUMMARY

Appellants claim a method of joining two composite parts by disposing through both parts a plurality of reinforcing elements such that the reinforcing elements are exposed from both parts in an offset manner facing each other defining a joint region therebetween.

Boyce in contrast, specifically teaches inserting a single fiber through one composite part and then filing the exposed portion of the fiber flush. Accordingly, Boyce cannot be a proper §103 reference since there is no teaching of appellants' claimed method. Boyce fails to teach or suggest a joint region between two composite parts.

Appellants further claims disposing an adherent interlayer within the joint region such that an application of pressure to the parts causes the exposed ends of the reinforcing elements to pierce both the adherent and opposing part adherend to form a more cohesive bond between the adherends.

Boyce does not disclose or infer the use of an adherent

interlayer at all.

Further, appellants' claimed method allows the adherends to be cured in separate steps allowing each part to be manufactured separately and brought together only for the purposes of their joining. Boyce, in contrast discloses the necessity to co-cure the parts once the reinforcing elements are inserted.

III. SEPARATELY DISTINGUISHING APPELLANTS CLAIMS OVER BOYCE

The appellants assert that the claims do not stand or fall together.

Claim 1 is separately patentable because it recites a method of joining composite parts comprising:

- (a) disposing a plurality of reinforcing elements through the thickness of two composites adherends to be joined, at least a number of said reinforcing elements extending from the joint surface of each said adherend;
- (b) assembling said adherends so that the joint surface of one said adherend faces the joint surface of the other said adherend defining a joint region therebetween, said extending reinforcing elements interstitially disposed in said joint region; and
- (c) disposing an adherent within said joint region about said interstitially disposed reinforcing elements and said joint surfaces.

Boyce does not disclose nor infer disposing a plurality of reinforcing elements through the thickness of two adherends, nor leaving the elements extending (Boyce teaches the opposite: filing them flush) nor assembling these adherends so that the joint surface of the one faces the joint surface of the other defining a joint region therebetween, nor disposing an adherent in this joint region about the reinforcing elements. Further, the terms "reinforcing elements" and "adherent" are well defined within the context of the specification such that a skilled artisan would be readily enabled to make or use this invention.

Claim 2 is separately patentable because it recites that the adherends are carbon-carbon composite structures. Nowhere in Boyce is the use of more than one part or adherend disclosed, and therefore such adherends being carbon-carbon composite structures allows claim 2 to be patentably distinct.

Claim 3 is separately patentable because it recites that the reinforcing elements are fibers. Boyce does not disclose the use of the reinforcing elements as the appellants do, therefore appellant's use of fibers as reinforcing elements in this manner is novel and unobvious. Further, the term reinforcing elements is well defined within the context of the specification such that a skilled artisan would be readily enabled to make or use the invention.

Claim 4 is separately patentable because it recites that the adherent is a metallic braze material. Boyce does not disclose the use of an adherent.

Claim 6 is separately patentable because it recites a method of joining composite parts comprising:

- (a) disposing a plurality of reinforcing elements through the thickness of two composite adherends, said reinforcing elements extending from the joint surface of each said adherend;
- (b) assembling said adherends so that the joint surface of one said adherend faces the joint surface of the other said adherend;
- (c) disposing an adherent interlayer between said opposing joint surfaces;
- (d) urging said extending reinforcing elements of each said adherend through said adherent interlayer and interstitially locking said reinforcing elements therein.

Boyce does not disclose or infer disposing a plurality of reinforcing elements through the thickness of two composites adherends, nor assembling these adherends so that the joint surface of one faces the joint surface of the other, nor disposing an adherent interlayer between the opposing joint surfaces and urging the reinforcing elements of each adherend through the adherent interlayer and interstitially locking the reinforcing elements therein. Further, the terms reinforcing elements and adherent are

well defined within the context of the specification such that a skilled artisan would be readily enabled to make or use this invention.

Claim 7 is separately patentable because it recites that the adherent interlayer is a prepreg material, the method further including the step of curing this material. Boyce does not disclose or infer the use of an adherent interlayer and therefore the method further including the step of curing this adherent interlayer cannot be found in the Boyce reference.

Claim 9 is separately patentable because it recites a method of joining composite parts comprising:

- (a) disposing a plurality of reinforcing elements through the thickness of a first composite adherend to be joined, at least a number of said reinforcing elements extending from the joint surface of said first adherend;
- (b) assembling said first adherend with a second adherend such that the joint surface of the first said adherend faces the joint surface of the second said adherend at the joint region therebetween, said extending elements of said first adherend disposed against the joint surface of said second adherend; and
- (c) disposing an adherent within said joint region.

Boyce does not disclose or infer disposing a plurality

of reinforcing elements through the thickness of a first adherend to be joined, nor assembling the first adherend with the second adherend such that the joint surface of the first faces the joint surface of the second allowing the extending elements of the first adherend to be disposed against the joint surface of the second adherend nor disposing an adherent within the joint region.

Claim 10 is separately patentable because it recites a method of joining composite parts comprising:

- (a) disposing a plurality of reinforcing elements through the thickness of a first composite adherend at the joint surface of said first adherend, at least a number of said reinforcing elements extending from the joint surface of said first adherend;
- (b) assembling said first adherend with a second adherend such that the joint surface of the first said adherend faces the joint surface of the second said adherend;
- (c) disposing an adherent interlayer between said opposing joint surfaces; and
- (d) urging said extending reinforcing elements of said first adherend through said adherent interlayer and against the joint surface of the second said adherend and locking said reinforcing elements therein.

Boyce does not disclose or infer disposing a plurality

of reinforcing elements through the thickness of a first composite adherend at the joint surface of this adherend, nor assembling the first adherend with a second adherend such that the joint surface of the first faces the joint surface of the second, nor disposing an adherent interlayer between the opposing joint surfaces and urging the extending reinforcing elements of the first adherend through the adherent interlayer and against the second joint surface and locking said reinforcing elements therein.

Claim 11 is separately patentable because it recites that the adherent interlayer is a prepreg material, the method further including the step of curing said prepreg. Boyce does not disclose or infer the use of an adherent interlayer.

Claim 12 is separately patentable because it recites a method of joining composite parts comprising:

- (a) disposing a plurality of reinforcing elements through the thickness of two composite adherends at the joint surface of each said adherend to be joined;
- (b) assembling said adherends so that the joint surfaces of one said adherend faces the joint surface of the opposing said adherend;
- (c) disposing an adherent within the joint region defined by said facing joint surfaces and urging said adherent to flow at least partially along the length of said reinforcing elements within said

adherends.

Boyce does not disclose or infer disposing a plurality of reinforcing elements through the thickness of two composites adherends at the joint surfaces of each adherend to be joined, nor assembling the adherends so that the joint surface of one faces the joint surface of the other, nor disposing an adherent within the joint region and urging the adherent to flow at least partially along the length of the reinforcing elements within the adherends.

Claim 13 is separately patentable because it recites a method of joining a composite part with a non-composite part comprising:

- (a) inserting, through the thickness of said composite part, a plurality of reinforcing elements extending through the joint surface thereof;
- (b) assembling said composite part such that said reinforcing elements are proximate the joint surface of said non-composite part; and
- (c) brazing said joint surfaces and said reinforcing elements to form a joint.

Boyce does not disclose or suggest assembling a composite part such that the reinforcing elements are proximate the joint surface of the non-composite part and brazing the joint surfaces and the reinforcing elements to form a joint.

Claim 14 is separately patentable because it recites a

method of joining composite parts comprising:

- (a) inserting, through the thickness of each said composite part, a plurality of reinforcing elements extending from the joint surface thereof;
- (b) assembling said composite parts such that said reinforcing elements are interstitially disposed at the joint region therebetween;
- (c) selecting a braze material compatible with said composite parts and said reinforcing elements;
- (d) applying said braze material to said joint region; and
- (e) urging said braze material to flow about said interstitially disposed reinforcing elements; and
- (f) allowing said braze material to harden.

Boyce does not disclose or infer inserting plurality of reinforcing elements, through each part nor assembling the two parts such that the reinforcing elements are disposed in the joint region, nor selecting a braze material, compatible with the composite parts and reinforcing elements, nor applying the braze material to the joint region, nor urging the braze material to flow about the interstitially disposed reinforcing elements, nor allowing the braze material to harden.

Claim 15 is separately patentable because it recites a method of joining composite parts comprising:

- (a) inserting, through the thickness of one said

composite part, a plurality of reinforcing elements extending from the joint surface thereof;

- (b) assembling one said composite part with a second composite part such that said reinforcing elements are disposed about the joint surface of said second composite part;
- (c) selecting a braze material compatible with said composite parts, and said reinforcing elements;
- (d) applying said braze material to the joint region between said composite parts;
- (e) urging said braze material to flow about said reinforcing elements; and
- (f) allowing said braze material to harden.

Boyce does not disclose or infer assembling one composite part with a second composite part such that the reinforcing elements are disposed about a joint surface of the second composite part, nor selecting a braze material compatible with the composite parts and the reinforcing elements, nor applying the braze material to the joint region between the composite parts, nor urging the braze material to flow about the reinforcing elements, nor allowing the braze material to harden.

Claim 16 is separately patentable because it recites a method of joining composite parts comprising:

- (a) inserting, through the thickness of each said composite part, a plurality of reinforcing

elements extending from the joint surface thereof;
(b) selecting an adherent interlayer material for joining said parts;
(c) assembling said composite parts such that said joint surfaces face each other with said adherent interlayer therebetween;
(d) driving said reinforcing elements into said adherent interlayer and curing said adherent interlayer locking said reinforcing elements therein.

Boyce does not disclose or suggest inserting through the thickness of each of two composite parts, a plurality of reinforcing elements extending from the joint surfaces thereof, nor selecting an adherent interlayer material for joining these parts, nor assembling said composite parts such that the joint surfaces face each other with the adherent interlayer therebetween, nor driving the reinforcing elements into the adherent interlayer and curing the adherent interlayer locking the reinforcing elements therein.

Claim 17 is separately patentable because it recites that the adherent interlayer is a prepreg material and the step of driving said reinforcing elements and curing includes subjecting the assembly to elevated pressure and temperature. Boyce does not disclose or infer the use of an adherent interlayer and therefore the step of driving the reinforcing elements and curing including subjecting the

assembly to elevated pressure and temperature are not found in the Boyce reference.

Claim 18 is separately patentable because it recites a method of joining composite parts comprising:

- (a) inserting, through the thickness of one composite part, a plurality of reinforcing elements extending from the joint surface thereof;
- (b) selecting an adherent interlayer material for joining said parts;
- (c) assembling said composite parts such that said joint surfaces face each other with said adherent interlayer therebetween;
- (d) driving said reinforcing elements into said adherent interlayer and curing said adherent interlayer locking said reinforcing elements therein.

Boyce does not disclose or infer selecting an adherent interlayer material for joining parts, nor assembling composite parts such that the joint surfaces face each other with the adherent interlayer therebetween, nor driving the reinforcing elements into the adherent interlayer and curing the adherent interlayer locking the reinforcements therein.

Claim 19 is separately patentable because it recites a method of joining a composite part with a non-composite part comprising:

- (a) inserting, through the thicknesses said composite part, a plurality of reinforcing

elements at least at the joint region thereof;
(b) assembling said composite part such that reinforcing elements are disposed proximate the joint surface of said non-composite part; and
(c) brazing said joint surfaces and urging braze material to flow along the lengths of said reinforcing elements into said composite part.

Boyce does not disclose or suggest assembling a composite part such that the reinforcing elements are disposed proximate the joint surface of a non-composite part, nor brazing the joint surfaces and urging braze material to flow along the lengths of the reinforcing elements into said composite.

Claim 20 is separately patentable because it recites a method of joining composite parts, comprising:

- (a) disposing a plurality of reinforcing elements through the thickness of the composite adherends to be joined, at least a number of said reinforcing elements exposed at a joint surface of each said adherend;
- (b) assembling said adherends so that the joint surface of one said adherend faces the joint surface of the other said adherend defining a joint region therebetween; and
- (c) disposing an adherent within said joint region and about said exposed reinforcing elements and said joint surface.

Boyce does not disclose nor infer disposing a plurality of reinforcing elements through the thickness of composite adherends to be joined, with at least a number of the reinforcing elements exposed at the joint surface of each of the adherends, nor assembling the adherends so that the joint surface of one faces the joint surface of the other defining a joint region therebetween, nor disposing an adherent within the joint region and about the exposed reinforcing elements and the joint surface.

Claim 22 is separately patentable because it recites a method of joining a composite part with a non-composite part, comprising:

- (a) inserting, through the thickness of said composite part, a plurality of reinforcing elements at least at the joint region thereof, said reinforcing elements exposed at the joint surface of said composite part;
- (b) assembling said composite parts such that said exposed reinforcing elements are disposed proximate the joint surface of said non-composite part; and
- (c) disposing an adherent about said exposed reinforcing elements and said joint surfaces.

Boyce does not disclose or infer inserting through the thickness of a composite part a plurality of reinforcing elements at least at the joint region thereof, with the reinforcing elements exposed at the joint surface of the

composite part, nor assembling a composite part such that the exposed reinforcing elements are disposed proximate the joint surface of the non-composite part, nor disposing an adherent about said exposed reinforcing elements and said joint surfaces. In all the claims, the terms reinforcing elements and adherent are well defined within the context of the specification such that a skilled artisan would be readily enabled to make or use the invention claimed.

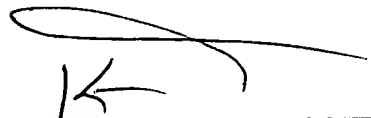
In conclusion, because the reference suggested by the Examiner is believed to be improper under the correct legal standard regarding 35 USC §103; because the reference suggested by the Examiner does not disclose nor infer joining two composite parts by disposing through both parts a plurality of reinforcing elements; because Boyce does not disclose nor infer disposing an adherent interlayer within the joint region between the two adherends to be joined; and because appellants' claimed method allows the adherends to be cured separately it is respectfully submitted that the appellants claims, directed to a method of joining composite parts should be allowed.

Each of Examiner's rejections has been addressed or traversed. Accordingly, it is respectfully submitted that the claims on appeal are in condition for allowance. Early and favorable action is respectfully requested.

If for any reason this Brief is found to be incomplete, or if at any time it appears that a telephone conference with counsel would help advance prosecution, please

telephone the undersigned or his associate, Joseph S.
Iandiorio, collect in Waltham, Massachusetts, (617) 890-
5678.

Respectfully submitted,

A handwritten signature in dark ink, appearing to be "Kirk Teska", written over a horizontal line.

KIRK TESKA
REG NO. 36,291